International Journal of Food Science and Nutrition
www.foodsciencejournal.com
ISSN: 2455-4898
Received: 08-05-2021, Accepted: 23-05-2021, Published: 07-06-2021
Volume 6, Issue 3, 2021, Page No. 69-71

Utilization of coconut flour and coconut milk in the formulation of candy

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Abstract

Coconut flour is a by-product of coconut oil industry. The flour is gluten free and is rich in protein, fat and fibre which can be considered as functional potential food. An attempt was made to utilize the coconut flour in the formulation of coconut candy. A standard candy was prepared with rice four and cow milk as the key ingredients. In the variant the rice flour and cow milk were replaced with coconut flour and coconut milk. The standard and the variant were subjected to proximate analysis and sensory analysis. The results of the standard and variant were compared. The results revealed significant differences ($p<0.05$) in moisture, fat and carbohydrate content. There was no significant difference ($p>0.05$) in protein values. The variant which consisted of coconut flour and coconut milk had comparatively less moisture, carbohydrate and higher percentage of protein, fat. Sensory analysis was performed using a 5 point hedonic scale for standard and variant to evaluate taste, aroma, texture, mouth feel and overall acceptability. The variant with coconut flour and coconut milk received higher scores and was found to be acceptable. The work thus suggests the utilization of coconut flour in formulating candies.

Keywords: candy, coconut flour, coconut milk, gluten free

Introduction

Candy making continues to be primarily an art to a greater extent than most other modern food-processing operations. Candy refers to confectionary or sweet which describes a spectrum of sweet goods and takes on different meanings from one country to the other. Candies are also defined as a highly cooked, colored and flavored sugar mass formed into desired shapes. Candy is made by dissolving sugar in water or milk to form syrup which is boiled until it reaches the desired concentration or starts to caramelize. The type of candy depends on the ingredient and how long the mixture is boiled (Onwuka, 2014). The popularity of candies is attributable largely to their great variety and the scope afforded for originality in developing a wide diversity of qualities. Major improvements in this are the result of advances in the science and technology of the food materials used as ingredients of candy (Martin, L. F). Most commonly milk from animal origin is used in candy production. Use of imitation milk and by products from plants and nuts can be researched in the manufacturing of candy.

The coconut (Cocosnucifera L.) is an important fruit tree in the tropical regions. Coconut provides a wholesome and nutritious source of meat, water, milk, and oil. Coconut is also considered as a 'functional food' because it provides additional health benefits apart from its nutritional constituents. The various edible products from coconut includes coconut milk, dried coconut or copra, desiccated coconut, coconut oil, coconut water, Nate-de-coco, coconut flour, vinegar, jaggery, syrup, jelly, chips etc.

Coconut milk is an oil-water emulsion obtained from the aqueous extract of coconut meat by mechanical press usually with added water. It is a natural and very versatile ingredient broadly used in Asian and Indian cuisine. Milk can be used in confectionaries, bakeries, biscuits and ice cream industries worldwide to enhance flavor and taste of various products. Nieuwentus and Nieuwelink (2002) reported that coconut milk is very rich in minerals and vitamin content while saturated fat was 10 % total energy. Fat in coconut milk improves digestion and bowel function, supports tissue repair and immune system functions, help protect the body from breast, colon and other cancers, improve the cholesterol ratio, reduce the risk of heart disease and increase the metabolic rate of body fat, among other benefits (Tijani *et al*., 2017). The presence of lauric acid in coconut milk acts as antiviral and antibacterial agent; magnesium controls the blood sugar level; phosphorus strengthens the bones; selenium reduces the joint inflammation and manganese helps to prevent osteoporosis.

Traditionally, candies are made from cow milk but there is little or no information to various sources of imitation milk in candy preparation. However there are investigations done on partial substitution and milk blends.

The residues obtained after oil extraction from coconut meat possess good nutritional properties which can be used for value addition of various processed foods. It is dried to make flour which is reported as a rich healthy source of dietary fiber and protein. As it is gluten-free, the flour has recently become increasingly important in the bakery industries where it is used in partial substitution to wheat in order to produce baked snacks such as cookies. It can be used as bulking agent, filling agent and as a substitute for wheat, rice and potato flour at certain levels. There is little or no investigation done on replacing whole coconut flour in the food products and its utilization in production of candy.

This research work seeks to evaluate proximate and consumer's acceptability of a candies made from coconut flour and coconut milk.

Materials and methods

Materials

Chemicals and solvent were used from the laboratory stock, Department of Food Science, M.O.P Vaishnav College for Women, Chennai. Coconut milk, coconut flour, white sugar, shortening (oil), rice flour, black gram dal flour and standard milk were procured from the local market. Glass containers were used for storage of samples.

Formulation of candy

The candy is formulated using coconut milk, coconut flour and rice flour as the major ingredient (Table 1). Candy was prepared by following the method mentioned by Sangamithra A *et al*., (2013) [12]. However, slight modifications were made in the method to suit this study. A control sample was made with rice flour alone. Sugar is added to standard milk and is heated until caramelization occurs and shortenings are then added slowly along with the rice flour. It is mixed homogeneously for 10 minutes using a hand whisk. The batter was made into a semi-solid form in order to hold the shape. Formulated candy for evaluation was prepared by replacing with coconut flour and coconut milk.

Table 1: List of ingredients used in formulating the candy

S. No	Ingredients	Amount (g)	
		standard	variation
1	Rice flour	64	-
2	Black gram dal flour	15	15
3	Standard milk	30 ml	-
4	Sugar	60	60
5	Oil	20 ml	20 ml
6	Coconut flour	-	64
7	Coconut milk	-	30 ml
8	Kesar colour	A pinch	A pinch

Analysis

Moisture content was determined by direct gravimetric method (oven drying). Protein content was determined using Kjeldahl method. Lane and Eyon's method was used to determine sugars (invert and sucrose) and soxhalet method was used for fat.

Sensory evaluation

A 5 point scale sensory evaluation was performed to assess the degree of acceptability. The consumer panelists were asked to rate the sample for taste, aroma, texture, mouth feel and overall acceptability on a 1- 5 point scale where 5 = like extremely, 4 = like, 3 = neither like not dislike, 2 = dislike, 1 = dislike extremely.

Results and discussion

Proximate composition

The proximate composition of candy is presented in Table 2. There were significant ($p<0.05$) difference in the moisture content of the candy samples. The value (3.97%) of the coconut flour based candy in this work was found to be higher (2.66%) than the value reported by Onyekweln (2018) but lower than the values (18.6% and 5%) reported by Farooqui. M.U (2014) and Hossain M.B (1999) in coconut milk chocolate and coconut delight candy respectively. The difference in the values can be attributed to the formulation and processing of the candies. However, the moisture content increased upto 20.5% in partial substitution of coconut flour with 30% in plain cake (Hossain S *et al*, 2016) [6].

The protein content did not show any significant ($p>0.05$) difference. The values obtained are lesser than those reported by Onyekweln (2018) but it is similar to the value obtained by Farooqui M.U (2014) for coconut milk chocolate and is higher (15.7%) in coconut delight candy reported by Hossain M.B, 1999. However, the coconut flour incorporated in preparation of wheat bread (Gunathilake K.D.P.P, 2009) increased upto 21.65% and upto 7.40% in plain cake incorporated with 30% coconut flour (Hossain S. *et al*, 2016) [6]. The difference in the values may be because of the coconut variety used and the method used for extraction of flour and milk.

Table 2: Proximate Composition of the candies

S. No	Parameters	Standard	Variation
1	Moisture %	4.43±0.004	3.926±0.071
2	Protein %	0.175±0.035	4.588±0
3	Fat %	12.146±0.173	18.585±0.016
4	Carbohydrate % Sugars %	67.685±0.742 20.27±1.852	59.54±1.018 11.495±0.403

Significant ($p<0.05$) difference was observed in the fat content among the candies prepared which was lesser (26.97%) than that reported by Onyekweln (2018), 21.07% in coconut milk chocolate (Farooqui. M.U, 2014) and 9.1% in coconut delight candy (Hossain M.B, 1999). However, in the wheat bread incorporated with coconut flour had less percent of fat (8.42%) (Gunathilak K.D.P.P, 2009) and in plain cake there was an increase in the fat content as the levels of coconut flour incorporation increased. The decrease in the fat content of the candy is advantageous for the keeping quality of the candy as chances of rancidity would be greatly reduced (Sunny- Roberts *et al*., 2004).

There were significant ($p<0.05$) difference in the carbohydrate and sugar content in the formulated candy. It was found that the values were similar to the values (60.97%) obtained by Onyekweln (2018) and lesser (63.01%) than those reported in coconut milk chocolate by Farooqui. M.U, 2014 whereas in coconut delight candy the percentage has increased upto 67.3% (Hossain M.B, 1999). However carbohydrate in the coconut flour incorporated wheat bread was found to be 59.77 (Gunathilak K.D.P.P, 2009). Similarly increased level of incorporation of coconut flour decreased the percentage of carbohydrate in the plain cake (Hossain S *et al*, 2016) [6].

Sensory evaluation

The mean score of the sensory evaluation performed is presented in Table 3. It revealed that both the standard and the variation were accepted by the 10 membered consumer panelists.

Table 3: Mean sensory score of the candies

Code	Taste	Aroma	Texture	Mouth Feel	Overall acceptability
123 (standard)	3.9	3.6	3.1	3.5	3.5
468 (variation)	3.8	3.8	3.6	3.7	3.7

The finding indicated that there were no significant ($p<0.05$) difference in the total scores. The taste was slightly better for the standard with a point score of 3.9 against the variation with a score of 3.8. However the scores were close to each other with a minimum difference. Similarly the aroma, texture, mouth feel and the overall acceptability of the product was better with the variation with a score of 3.8, 3.6, 3.7, and 3.7 respectively against the standard with a point score of 3.6, 3.1, 3.5, and 3.5 respectively. Thus the candy prepared using coconut flour and coconut milk was preferred and acceptable.

Conclusion

The candy prepared using coconut flour and coconut milk was appreciably good in nutrient content. Candy from these types of milk had comparable nutritional values with the candy which was made of animal milk. Hence, various types of food at different level of incorporation can be worked to obtain a nutrition dense product. The candy was acceptable and preferred by the consumer panelist when compared to the control. However further investigation on the levels of coconut flour to be used and effect of sugar level on the candy under large scale production and shelf life study has to be carried out to bring the product into commercial market.

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